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Determination of hydrazine derivatives by flow-injection analysis with spectrophotometric detection

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Abstract

Flow-injection analysis for the determination of hydrazine derivatives based on their nucleophilic substitution reaction with 4-chloro-5,7-dinitrobenzofurazan in aqueous medium, and spectrophotometric detection has been described. The calibration graphs were linear in the range from 0.15 to 4.0 $\mu g\,ml^{-1}$ of hydrazine derivatives, with sampling rates of up to 28–32 samples h^{-1}. Interferences from amino compounds, benzoic acids, aliphatic amines and ammonia have been evaluated. The procedure has been applied to the determination of hydrazine derivatives in serum, urine, apressin drugs and artificial mixtures.

1. Introduction

Hydrazine derivatives (hydrazides and N-substituted hydrazines) are very important groups of organic compounds, having various applications in analytical chemistry [1]. Many of these substances are physiologically active and are used as a remedy against tuberculosis, leprosy, mental disorder and hypotension. Various analytical techniques have been applied for their determination in biological fluids, drugs and other substances. Among the assay procedures listed in official compendia [2], titrimetric methods for the determination of pure drugs are most widely used. Other methods described in the literature are based on high-performance liquid chromatography [3–5], gas chromatography [6], fluorimetry [7], colorimetry and specrophotometry [8–10]. In these cases, the preliminary derivatization of the compounds under determination by various reagents (4-dimethylaminobenzaldehyde, 2,4-pentadione, 3-salicyclic aldehyde, 4-trinitrobenzenesulfonic acid and others) is needed. However, these reactions are rather slow and often demand high temperatures [11]. That is why their applications in a flow-injection analysis (FIA) system for the determination of hydrazine derivatives is undesirable. Besides, the spectral characteristics of the reaction products formed from the substituted hydrazines and other amino compounds (alkylamines, amino acids, etc.) are similar. Therefore, the utilization of these reactions in the FIA of compounds of complicated composition with spectrophotometric detection is restricted. At the same time, there is a necessary to use FIA for the determination of substituted hydrazines in various substances.

The application of 4-chloro-5,7-dinitrobenzofurazan (DNBF) in selective spectrophotometric determinations of hydrazine, hydrazides acids and arylamines in complicated mixtures containing alkylamines, phenols, amino acids and other organic and inorganic substances has been described in previous papers [12–15]. It was stated that DNBF exhibited high reactivity in modification reactions with amino compounds. The colored products have high molar

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